43.3.1 Bhakra Dam Spillway a Case Study

Maximum discharge through drum gate	7500 m^3/ s
Maximum normal water level u /s of gate	512.064 m.
Design head for the peak discharge taken by Bhakra experts	10.05 m
Design head	8.54 m
Design Flood, Design discharge	11327 m^3/ s / 8212 m^3/ s respectively
Maximum allowable discharge over a spillway is	1.647 * normal discharge i.e., 1000 Year flood discharge 1.648
Peak normal discharge per unit length of spillway	113.75 m^3/ s
Length of spillway L_1	67.056 m
Distance of Toe of spillway from crest	287.831 m
Discharge per unit length of spillway q at head h_S is given by and C is the coefficient of discharge and is assumed constant.	$q = q_d \left(\frac{h_s}{h_d} \right)^3$
It is straight gravity	dam 225.55 m, crest length 79.24 m (4 radial gates 15.24 m * 14.47 m)
Slope of the spillway	0.8 : 1
Curvature of toe to apron	114.3 m.
Sloping apron	10 : 1 with a length of 118.73 m.
Tail water details	
100 year flood level 35.05 m above the sloping apron exit. Normal water level 14.93 m above the sloping apron exit. Normal maximum tail water level 20.72 m. above the sloping apron exit. River bed is 12.192 m above the lowest point of the sloping apron.	

43.3.2 Comparison of Results

Flow Characteristics	Non- aerated flow	Aerated flow	Basin Type III	Remarks
y_1, y_T (m)	2.205	2.36	2.205	
Velocity m/s	51.58	52.06	51. 58	
F_1, F_T	11.09	10.04	11.09	
y_2 (m)	33.08	31.996	33.08	
L_{rj} (m)	142.00	145.00	143.00 (Basin length)	144.00 (Actual Basin length)
L_{cj} (m)	367.77	336. 403		
$\overline{C}_m$	0.629	0.5935		
$\overline{C}_r$	0.141	0.1513		
$\overline{C}_{av}$	0.315	0.296		
$\overline{C}_{avr}$	0.405	0.379		
Free Board or (bulkage depth) (m)	5.45	5.70		
Basin height (m)	38.53	37.7		
Energy loss in the basin (m)	75.26	74.08		